The Effect of Nipple Height on Broiler Performance[1]

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ABSTRACT Two trials, using a total of 3,200 male broilers, were conducted to compare the effects of a trough drinker versus three different heights on a nipple drinker system on body weight gain and feed:gain. The broilers were housed in temperature-controlled litter pens at 25 or 30 C. An 8-ft open trough was used. The nipple drinker heights were adjusted as 1) low (no neck stretch and drink from the side of the beak), 2) medium (stretch neck and drink from the end of the beak), and 3) high (first elevate breast, then stretch neck and drink from the end of the beak) positions. The nipple heights were adjusted twice weekly by visual inspection. The open drinker produced the heaviest birds. No significant treatment differences were observed for feed:gain at 25 C but increased numerically with increasing nipple height. This same pattern was evident at 30 C, but statistically significant differences did occur. Drinking from a nipple drinker is an unnatural drinking act for birds, and the greater the neck extension, especially during a panting situation, the more detrimental the effect on both body weight and feed:gain.

(*Key words*: broiler performance, nipple height, waterers, feed:gain)

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INTRODUCTION

Nipple drinkers are the predominant drinkers utilized in the production of broilers. Some advantages of nipple drinkers include labor savings in cleaning, less water wastage, and reduced processing plant condemnation. Differing nipple drinkers have differing flow rates. Carpenter et al. (1992) noted increased body weights with high flow rates (2.3 mL/s) of nipple drinkers for broilers as compared with low flow rates (0.4 mL/s). Donkoh (1989) demonstrated water consumption increased with increasing ambient temperatures from 20 to 35 C. May et al. (1997), investigating water consumption of broilers at high cyclic temperatures (24 to 35 to 24 C), noted similar water usage with a bell-type drinker and nipple drinkers during the lower temperatures but reduced water usage for the nipple system during the high part of the cycle. Also, they noted water consumption was decreased by increased nipple height. Weight gains are reduced with nipple drinkers as compared with open-type drinkers at high ambient temperatures (30 C) with the reduction attributed to panting (Lott et al., 1998). Increased air velocity over the birds to 125 m/min in tunnel-ventilated boiler housing reduced panting and weight gain, and feed:gain was similar with open and nipple drinkers. The objective of this study was to compare the effects of an open-type drinker and differing nipple heights on production parameters of broilers at 25 or 30 C.

MATERIALS AND METHODS

A total of 3,200 male broilers of a fast growing strain was used in two trials. The research was conducted in an environmentally controlled house having 32 pens. Each pen was 1.5×3.6 m and was stocked with 50 chicks. All birds were provided a starter diet, ad libitum, having 3,150 kcal/kg and 1.15% lysine from 0 to 3 wk of age. A finisher diet with 3,200 kcal/kg and 1.03% lysine was fed from 3 to 7 wk of age. All birds were reared to 3 wk of age on nipple drinkers. All birds were brooded in a common environment at 29.4 C through the first week. At 1 wk, the temperature was reduced to 26.7 C and maintained at that temperature until 3 wk. At 3 wk, the birds were randomly assigned to the 32 pens, and body weights were equated by pens. A 2×4 randomized complete block design with a factorial arrangement was used (two temperatures and four drinkers). Each block consisted of four pens represented by each treatment within a temperature. Sixteen pens were maintained at 25 C and 16 pens were at 30 C. An 8-ft trough (open drinker) was used along with three different nipple heights. The nipple system height was adjusted to low (no neck stretch and drink from the side of the beak), medium (stretch neck and drink from the end of the beak), and high (first elevate breast, then stretch neck and drink from the end of the beak). The drinker heights were adjusted twice weekly

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TABLE 1. Height (cm) of open and nipple drinkers at various temperatures and ages

			Nipple height		
Temperature (C)	Bird age (d)	Open	Low	Medium	High
25	21	22	32	35	38
25	24	25	34	37	39
25	27	28	36	39	41
25	31	28	37	42	44
25	35	29	38	43	46
25	38	30	42	45	49
25	42	32	43	45	49
25	46	32	44	47	49
30	21	22	31	35	38
30	24	25	36	38	41
30	27	27	37	39	42
30	31	27	37	43	45
30	35	28	37	43	45
30	38	30	38	45	46
30	42	30	40	45	46
30	46	30	42	45	49

based on visual inspection. The actual heights are presented in Table 1.

Body weight and feed consumption data were collected weekly from 3 to 7 wk of age. Mortality was recorded daily. Data were analyzed by the general linear model program of SAS software (1990) using Duncan's multiple-range test to compare treatment means. Mortality data were analyzed using chi-square.

RESULTS

The use of open drinkers resulted in significantly heavier birds at each weighing than did nipple drinkers at any height within a temperature (Table 2). Body weights of birds drinking from the low or medium height drinker at 25 C did not differ significantly from each other at any weight period. However, significantly depressed body weights were noted for each weight period with the high nipples as compared with any other treatment. For older birds, the percentage difference in body weight was greater between medium and high nipple heights at 25 C. The differences were 1.0, 2.4, 3.3, and 5.3% from 3 to 7 wk, respectively.

Exposure to the 30 C environment resulted in significantly reduced body weight as compared with 25 C for all comparisons. Significant differences were observed between open, low, medium, and high nipple heights at every weight period, except for the low and medium at 4 wk.

The maximum body weight gains at 25 C occurred at the 4- to 5-wk period irrespective of treatment (Table 3). However, at 30 C, maximum body weight gains were noted for the 3- to 4-wk period for medium and high nipple heights. The open drinker had the highest body weight gain at the 4- to 5-wk weight period at 30 C.

No statistically significant differences were observed in feed:gain data at 25 C for the open drinker as compared with any nipple height (Table 4). At 30 C, the high nipple system significantly increased the feed:gain for the 3- to 4-wk period. For the 4- to 5-wk period and 5- to 6-wk period, the feed:gain for the open system was significantly improved over the medium and high nipple heights. For the 5- to 6-wk period, feed:gain data began to become erratic; by 6- to 7-wk, the data were almost meaningless with the nipple system at the higher temperature. Livability was significantly improved at 25 C (92.4%) as compared with 30 C (87.6%).

DISCUSSION

Water restriction will restrict feed intake (Chamblee et al., 1989), and with feed intake restricted, body weight

TABLE 2. The effects of drinker type and nipple height on body weights (g) of male broilers 4 to 7 wk of age

			Bird age (wk)			
Temperature (C)	Drinker type	Height	4	5	6	7
25	Open	. . .	1,424[a]	2,112[a]	2,754[a]	3,275[a]
25	Nipple	Low	1,411[b]	2,067[b]	2,700[b]	3,199[b]
25	Nipple	Medium	1,400[b]	2,052[b]	2,657[b]	3,164[b]
25	Nipple	High	1,385[c]	2,003[c]	2,570[c]	2,995[c]
30	Open	. . .	1,349[d]	1,924[d]	2,351[d]	2,632[d]
30	Nipple	Low	1,336[e]	1,865[e]	2,237[e]	2,395[e]
30	Nipple	Medium	1,333[e]	1,826[f]	2,115[f]	2,300[f]
30	Nipple	High	1,303[f]	1,761[g]	2,056[g]	2,104[g]

[a–g]Values within columns with no common letter differ significantly ($P < 0.05$).

TABLE 3. The effects of drinker type and nipple height on body weight gains (g) of male broilers from 3 to 7 wk of age

Temperature (C)	Drinker type	Height	Period (wk) 3–4	4–5	5–6	6–7
25	Open	. . .	589[a]	687[a]	642[a]	520[a]
25	Nipple	Low	574[ab]	657[b]	631[b]	500[a]
25	Nipple	Medium	565[bc]	652[b]	604[c]	477[ab]
25	Nipple	High	548[cd]	618[c]	566[d]	426[b]
30	Open	. . .	530[de]	575[d]	427[e]	281[c]
30	Nipple	Low	517[e]	529[e]	372[f]	158[de]
30	Nipple	Medium	509[e]	493[f]	290[g]	185[d]
30	Nipple	High	484[f]	457[g]	295[g]	99[e]

[a–g]Values within columns with no common letter differ significantly ($P < 0.05$).

TABLE 4. The effects of drinker type and nipple height on feed:gain of male broilers from 3 to 7 wk of age

Temperature (C)	Drinker type	Height	Period (wk) 3–4	4–5	5–6	6–7
25	Open	. . .	1.57[c]	1.76[e]	2.06[c]	2.53[d]
25	Nipple	Low	1.57[c]	1.77[e]	2.04[c]	2.63[d]
25	Nipple	Medium	1.58[c]	1.77[e]	2.11[c]	2.69[d]
25	Nipple	High	1.60[ab]	1.79[de]	2.16[bc]	2.81[d]
30	Open	. . .	1.62[b]	1.88[cd]	2.53[ab]	3.54[c]
30	Nipple	Low	1.62[b]	1.93[bc]	2.74[b]	5.53[a]
30	Nipple	Medium	1.63[b]	2.01[ab]	3.44[a]	4.23[b]
30	Nipple	High	1.66[a]	2.10[a]	3.15[a]	5.60[a]

[a–e]Values within columns with no common letter differ significantly ($P < 0.05$).

gains will be restricted. Lott et al. (1998) demonstrated that a reduction of latent heat (reduced panting) by means of increased air velocity increased body weight gains with nipple drinkers. May (unpublished data) observed a decrease in water consumption with increased air velocity as compared with birds in still air. May et al. (1997) indicated birds have difficulty drinking from high nipple drinkers as indicated by reduced water intake. Donkoh (1989) noted that higher temperatures decreased broiler growth rate, feed intake, and feed:gain and increased water consumption when compared with a lower temperature. Therefore, one would expect broiler performance to be reduced at 30 C as compared with 25 C. According to available literature on nipple drinkers (Carpenter et al., 1992), equal performance may be anticipated from open drinkers and nipple drinkers. However, in this research, the open drinker produced the heaviest birds in all cases. As bird weight increased, the disparity between body weight gains increased with increasing nipple height as compared with open drinkers, especially at 30 C. Therefore, this disparity indicates the nipple drinker will restrict water usage at 30 C and may restrict water usage at lower temperatures.

No significant differences were observed in the feed:gain at 25 C due to any treatment, although there was a trend of higher feed:gain as nipple height increased. This same pattern, although statistically significant, was evident at 30 C. We observed more panting at 30 C than at 25 C. Drinking from a nipple drinker is an unnatural drinking act for birds. Therefore, the further the neck has to be extended, especially during a panting situation, the more detrimental the effect on body weight and feed:gain.

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